Research Laboratory, Shop and Chemical Safety Procedures
Introduction

The Texas Transportation Institute (TTI) is committed to providing a safe and healthful work environment for its employees and visitors. All activities and work involve some level of risk to people and property. Many activities involve low-level risks of a type and magnitude routinely encountered and accepted as requiring no special measures for mitigation. Other activities may involve increased levels of risks and require additional, appropriate measures be taken to mitigate such risks.

The success of any risk management program is dependent upon each affected person understanding, accepting and adhering to the policies and practices of this program as well as other agency policies and programs.

All agency laboratories are classified as “Research Laboratories”, not “Academic Teaching Laboratories” as in those belonging to academic departments and commonly used in classroom instruction. For simplification purposes, agency research laboratories will be referred to as “laboratories” throughout this program.

Purpose

The purpose of this program is to enhance awareness of risk levels in the work environment and limit exposure of personnel and property to the lowest practical level of risk through philosophy of risk management, training of personnel, engineering controls, and establishment of policies and procedures.

The Research Laboratory, Shop and Chemical Safety Procedures are designed to provide all affected TTI employees information needed to work safely in laboratories, shops and/or with chemicals. These procedures, when carried out by TTI employees, will help ensure the safe and efficient accomplishment of our work objectives.

Nature of Work and Related Potential Risks

Work performed in TTI laboratories, shops and with chemicals often includes, but is not necessarily limited to:

- Characterizations of roadway pavement and structure materials
- Mixture designs for hot mix asphalt (HMA) and concrete mixtures
- Performance simulations of roadway materials and structures
- Electrical and electronic circuits work
- Erosion control materials testing
- Vehicle emissions testing
- Woodworking, metal working, machining and painting
- Maintenance of equipment
- Materials handling
- Housekeeping.

The nature of work can involve varying levels of risk. Example hazards present could include:

- Entanglement, cutting or smashing hazards
- Burn risks
- Splash or fume hazards
- Exposure to chemicals including corrosives, reactives, flammables and toxins
- Excessive noise
- Sharp objects
- Slipping or falling hazards
- Radiation exposure
- Electrical shock
- Compressed gas hazards
- Material handling risks
- Vehicle operation risks
- Environmental risks
Research Laboratory, Shop and Chemical Training Programs

Employees working in TTI laboratories, shops or with chemicals must receive adequate information on the safety and operational procedures, machinery, equipment, personal protective equipment (PPE) and best practices to follow when working in labs, shops or with chemicals. All employees working in labs, shops or with chemicals are required to:

- Complete the TTI Research Laboratory, Shop, and Chemical training program.
- Complete Texas A&M University Environmental Health and Safety Department (TAMU EHSD) Hazard Communication on-line training program.
- Complete work area specific training.

A form of completion shall be on file with the TTI Human Resources Office either through paper document or electronic database. Employees shall provide copies of related training documents to be maintained by the designated work area supervisor or coordinator.

In addition to the above required trainings, each affected facility should develop their own risk management and safety practices specific to the needs of their operation and document their employees’ participation in the training.

General Procedures

Follow these general procedures when working in laboratories, shops or with chemicals to protect from the potential risks that may be present:

- Only employees who have completed all required training programs shall be allowed to work in TTI laboratories and shops.
- Request work area specific training from your supervisor if you are not sure about proper operating procedures for tasks, equipment or proper handling of a chemical.
- Constantly watch for hazards and resolve or report them as appropriate.
- Do not engage in horseplay.
- Loose clothing or dangling, extended jewelry are not allowed.
• Long pants and closed-toe shoes should be worn.

• Employees should not bring food or drinks into work areas containing chemicals.

• Do not work if under the influence of alcohol or drugs.

• Access to exits, emergency equipment or emergency controls shall never be blocked.

• Work areas shall be kept clean and free from obstructions.

• Cleanup should follow the completion of any task or at the end of each day.

• Laboratories and shops shall be equipped with fire extinguishers, eyewash stations, and first aid kits, as appropriate.

• Emergency telephone numbers should be clearly posted in each work area.

• Appropriate personal protective equipment (PPE) such as gloves, hearing protection, eye protection, face protection, hard hats and steel toe footwear shall be used as required. Activities being performed will dictate the required PPE.

• Appropriate respiratory equipment shall be used when air concentrations are not sufficiently maintained by engineering controls.
  
  ○ The TTI Safety Office can coordinate respiratory fit testing through TAMU EHSD.

• Adequate ventilation shall be provided by use of fume hoods or other ventilation systems to prevent exposure to airborne substances.

• Follow manufacturer's requirements for use of equipment.

• Mechanical equipment shall have necessary guards in place to prevent contact with moving parts or electrical connections.

• Follow manufacturer and National Electric Code (NEC) instructions for handling and using electrical devices.

• Regularly inspect hand and power tools and use them only for their intended purposes.
• Do not use a defective tool.

• Keep your hands, hair, body and clothing clear of moving parts.

• Any material containing solvents must be heated in vented ovens.

• Equipment should have a designated storage location and be returned to that location after use.

• Properly use, handle and store compressed gas cylinders.

• Handle and store glassware with care.

• Do not use damaged glassware.

• Properly dispose of broken glassware and sharps.

• Follow precautions and proper storage and handling procedures for chemicals as based on Material Safety Data Sheets (MSDS) and Hazard Communication procedures.

• All bottles, containers and secondary containers shall be properly labeled.

• Avoid direct contact with items at extreme temperatures.

• Properly carry out test procedures.

• Follow proper radiological safety policies and procedures if using radioactive sources.

• Exercise proper lifting techniques and safe material handling practices.

• Unauthorized persons shall not be permitted into the laboratory or shop.

• Authorized visitors as approved by the area supervisor or lab manager in the lab or shop shall wear the appropriate PPE and be informed of potential hazards, location of exits and emergency equipment.

• The work area coordinator in charge of each work area shall ensure that the specific safety equipment and PPE required on the particular tasks are available and used by affected personnel and authorized visitors.
The names of the work area supervisors should be posted in their respective areas of responsibility. A list of the work area supervisors should be maintained by the lab or shop supervisor.
Personal Protective Equipment (PPE)

Every effort should be made to eliminate hazards through design or engineering methods. However, at times PPE may be necessary to protect from hazards of a task. TTI lab and shop facilities shall provide necessary PPE for their affected employees and authorized visitors. Common PPE that may be required includes:

Eye Protection

Safety glasses, goggles (direct or indirect ventilation), or face shields may be required to protect eyes from debris or liquid splashes.

- Safety glasses with eye shields shall be used in operations with increased risk of exposure to flying particles.
- Employees requiring prescription glasses shall wear goggles/face shields for equivalent protection unless the prescription glasses are industrial strength safety glass with side shields.
- Goggles with direct ventilation are recommended for dusty conditions.
- Goggles with indirect ventilation are recommended when handling liquid chemicals and the potential hazard does not require a face shield.

Hearing Protection

Ear plugs or muffs may be required to protect from exposure to excessive sound pressure levels.

- Hearing protection, full coverage ear muffs or foam ear plugs as appropriate, shall be worn whenever the sound level of an operation nears or exceeds levels with the potential of causing hearing damage.
- Hearing protection should be in place prior to conducting activities with the potential of causing hearing damage. Some examples are: power saws or other loud equipment such as power tools and air equipment, hammering on metal or in confined spaces or visiting an area where these activities are being performed.
Dust Masks and Respirators

Dust masks/respirators or fume/vapor respirators may be required for certain tasks to protect from inhalation of harmful particulate or vapor matter.

- A dust mask should be used for nuisance level dusts and mists.
- A cartridge type respirator shall be used for activities that generate excessive dust levels or vapor particulates requiring specialized respirator equipment.

TAMU EHSD will provide fit testing for employees requiring respirators.

Gloves

Leather gloves, cryogenic gloves, heat-resistant gloves, or chemical-resistant gloves may be required to protect from abrasions, burns, or direct exposure to chemicals.

- Leather gloves shall be worn when handling abrasive or sharp-edged objects.
- Cotton or leather gloves should be worn for light duty material handling.
- Heat resistant, insulated gloves shall be worn when handling any materials that will be placed in or removed from an oven.
- Cryogenic gloves shall be used when working with extremely cold materials.

Safety Footwear

Safety footwear shall be worn by employees engaged in material handling work that increases the potential risk of injury to the toe area.

TTI will reimburse authorized employees for their purchase of steel toe safety footwear.

Hard Hats

Hard hats shall be worn in work areas where there is a danger of head injury from impact or falling and/or flying objects.

Employees shall inspect their hard hat prior to wearing to ensure safety, no visible cracks or damage or dry rot of materials.
Safety Vests

Approved safety vests shall be worn by personnel while performing activities where increased visibility is needed.

Hazardous Materials

TTI adheres to the hazardous materials procedures established by TAMU EHSD. The following summarizes the highlights of the procedures:

- All hazardous materials must be handled, used, stored and disposed of in the appropriate, required manner.

- Hazardous materials must remain in their original containers with all labels affixed. The labels should contain at a minimum the following:
  - Material identity
  - Material hazards
  - Material manufacturer

- Secondary containers must be appropriately labeled and stored. Secondary containers should contain at a minimum the following:
  - Material identity
  - Material hazards

- Labs and shops should maintain inventories of chemicals.

- Employees must be trained on the hazards of chemicals they will work with.

- Employees need to know how to obtain and interpret Material Safety Data Sheet (MSDS) information.

- Employees must know how to obtain and use appropriate PPE for the hazardous materials they may be exposed to.

- Employees must know how to obtain and properly administer appropriate first aid equipment in the event of an emergency:
  - Showers or eyewash stations
  - Fire extinguishers
• Employees must coordinate with TAMU EHSD to dispose of hazardous materials requiring special disposal procedures. The TTI Safety Office can assist with the coordination through TAMU EHSD.

The lab or shop supervisor shall provide an annual chemical inventory to the TTI Safety Office for inclusion, as appropriate, in the TAMU EHSD Tier II annual report.

For all of the details of TAMU EHSD's hazardous materials procedures, visit TAMU EHSD at http://ehsd.tamu.edu/ or call 979-845-2132.

Additional information regarding the TTI Hazard Communication Program is available on the TTINet.

**Small Spill Response**

Handling small spills requires containment of the spill, cleanup, and decontamination of the area. Spills could involve hazardous materials such as corrosives, reactives, flammables, and toxins.

**Do not attempt to clean up a spill unless you have received proper training and can answer YES to ALL of the following questions:**

• Do you know the identification of the spilled substance?

• Do you have the MSDS information for the substance?

• Is the spill less than 25 gallons?

• Do you have all protective equipment necessary for working with the substance?

• If respiratory equipment is required, have you been fit-tested for your respirator by TAMU EHSD?

• Do you have all the appropriate supplies/equipment on hand required to clean up the substance?

• Can the spill be cleaned in one hour or less?

**If the answer to ANY of these questions is NO, do not attempt to clean up the spill.** Contact the lab supervisor who shall contact TAMU EHSD to determine if the spill meets reportable quantity requirements and for appropriate clean-up and disposal of any hazardous materials.
The lab supervisor shall contact the TTI Safety Office to report any spills and any action taken by TAMU EHSD.

**Materials Handling and Storage**

**General Procedures**

- Use lift equipment such as forklifts, pallet-jacks, dollies, hoists, cranes or carts, when possible. Employees must complete TTI’s Forklift Operator Training in order to operate forklifts.

- Employ safe practices when using forklifts, dollies and other material handling devices.

- Provide a large enough area clear from people and objects for lifting and placement of heavy objects.

- Wear safety footwear if the operation poses a meaningful foot injury risk.

- Wear leather gloves if abrasion risks or sharp-edged objects are present.

- Stack objects only on a firm foundation.

- Secure round objects so they cannot roll.

- Do not stack material so high as to cause an unsafe lifting and handling condition.

- Follow HazMat procedures when handling and storing hazardous materials.

- Do not work underneath lifted material unless the material is supported by an approved and inspected lift device operated by trained personnel.

- Avoid splinters, slivers, projecting nails, burrs and rough or slippery surfaces.

- Keep fingers and body parts away from pinch points.

- Wipe off greasy, wet, dirty or slippery objects before trying to handle them.

- Use extreme caution and wear proper protective equipment when working in wet environments to avoid slips and falls.
• Inspect extension cords and other electrical components regularly to avoid electrical shock hazards.

Fume Hoods

Fume hoods are found in most TTI laboratories. Follow these guidelines for fume hood use.

• Keep the sash closed
• Elevate large equipment
• Keep equipment and materials a minimum of 6 inches from the fume hood sash
• Keep the fume hood clean
• Do not use the fume hood for storage
• Do not modify the fume hood
• Do not block the airflow into the fume hood
• Do not use perchloric acid in standard fume hoods

Compressed Gas Cylinders

When using, handling or storing compressed gas cylinders, users should inspect each cylinder for:

• Irregular swelling of the external tank
• Excessive venting or leakage
• The presence of the pressure relief valve and rupture disc before use or filling

Cylinders should be secured when stored. Chain or strap devices are acceptable.

If any of these problems exist or are deficient, contact the TTI Safety Office for immediate assistance.
Forklifts

- Employees must complete TTI’s Forklift Operator Training in order to operate forklifts. Contact the TTI Safety Office for courses.
- Do not exceed the rated capacity of the lift.
- Avoid speeding or sudden stops, starts or maneuvers.
- Do not operate the lift if your vision is obstructed.
- Operate lifts with combustion engines only where adequate ventilation exists.
- Keep the load on the uphill side when traveling on an incline.
- Do not allow anyone to ride or stand on the lift unless they are properly located inside an OSHA-approved lift basket.
- Make sure all lift baskets are properly secured to the forklift prior to use.
- Never leave an employee unattended in a raised basket.

Manual Lifting and Carrying

- Do not lift more than you can handle comfortably.
- Never carry a load that you cannot see around.
- Keep your shoulders parallel to your hips when lifting. Do not twist.
- Place one foot alongside the object and one behind the object.
- Use the sit-down position and keep your back straight – remember that “straight” does not necessarily mean vertical.
- Draw the load close to your body and keep your arms and elbows tucked close to your body.
- Use your full palm to grip the object.
- Tuck in your chin and initiate the lift with a thrust of the rear foot.
- Keep manual lifting and carrying to a minimum.
Asphalt Handling and Storage

Only authorized and trained employees shall be permitted to handle hot asphaltic materials and operate asphalt compaction equipment.

Heating of asphaltic materials constitutes a fire hazard and proper precaution should be used.

Prevent open flames from contacting asphaltic materials or vapors.

- Ensure that work area is free of any obstructions.
- Gloves and face shields shall be worn while pouring hot asphalt. Use only protective gloves made of non-asbestos material that is rated for high-temperature use.
- When working with hot asphalt cement, employees shall wear thermal gloves with the length of the glove protection increasing in accordance to increases in the quantity of hot asphalt cement.
- A fully charged 20 lb. UL-rated dry chemical fire extinguisher should be readily available.
- All safety devices and thermostatic controls shall be maintained and kept in good working condition according to the manufacturer or department specification.
- Asphalt shall be stored as far away from other flammable materials as is practical.

Nuclear Test Equipment

Some TTI programs use nuclear sources to perform certain tests. All use of X ray equipment, radioactive materials, certain lasers and other sources of ionizing radiation must be licensed by the Nuclear Regulatory Commission (NRC), Texas or another state so authorized by the NRC and also must comply with the requirements of the Texas Regulations for Control of Radiation.

- Personnel using equipment containing radioactive materials must have taken and passed an approved nuclear safety training course. Employees shall provide to the lab supervisor the official training certificate stating that they have passed this course.
All equipment either producing or containing sources of ionizing radiation must be used in accordance with the manufacturers’ instructions.

Only equipment with its location specifically stated on the license may be possessed by the laboratory or facility.

All sources and their respective locations must be reported to the TAMU EHSD Radiation Safety Office.

**Housekeeping**

Good housekeeping reduces the potential for risks and improves productivity, morale and public relations.

- Access to exits, emergency equipment or emergency controls shall never be blocked.

- Work areas shall be kept clean and free from obstructions. Cleanup should follow the completion of any task or at the end of each day.

- Incorporate good housekeeping into every job and clean up at the completion of the job.

- Do not block doors or travel corridors.

- All outside storage areas shall be properly maintained and kept clear of debris.

- The supervisor and employees should routinely inspect for housekeeping hazards.

- Employees must promptly resolve housekeeping shortcomings.

- Additional activities outside the usual scope of tests and related preparation or support work or that require use of areas outside the usual, daily testing areas shall be reported to the supervisor.

- Employees shall report all safety concerns or witness of default of safety procedures in others.
Fire Prevention

- Each laboratory and shop shall be equipped with fire extinguishers. Fire extinguishers are designed to control fires of limited size.

- Fire extinguishers shall be conspicuously located and identified to ensure they are readily accessible. They shall be located along normal paths of travel including exit areas.

- Fire extinguishers should not be installed in the area of potential immediate danger.

- Employees should know how to operate the type of extinguisher(s) installed in their work areas. Supervisors can arrange for fire extinguisher training through TAMU EHSD.

- TAMU EHSD regularly inspects and maintains all fire extinguishers on the campus inventory.

- If you hear the fire alarm, evacuate immediately.

- Know at least two exit routes from your building.

- Keep passageways, storerooms and work rooms neat and orderly.

- Control the accumulation of flammable and combustible waste so they do not contribute to a fire hazard.

- Dispose of oily rags in appropriately labeled metal cans with covers.

- Store small quantities of flammable materials in flammable materials storage cabinets.

- Store flammable liquids only in Approved or Listed containers.

- Take precautions against fire or explosion when using flammable materials.
  
  o Store away from potential sources of ignition (such as open flames, sources of high heat, or equipment that produces mechanical or electrical sparks).
  o Use only in well ventilated areas.

- Clean up spilled flammable liquids immediately, if safe to do so.
Life Safety and Emergency Response

Each lab and shop shall provide their employees with emergency contacts and basic first aid equipment, as appropriate.

Dial 911 for ambulance, fire and police. From a phone system that requires you to dial a “9” prefix, dial 9-911.

- Provide the 911 dispatcher with the following information:
  - Location of emergency
  - If there are any injuries, describe type of injury, if known
  - Brief description of injured person (gender, age, etc.)
  - Your name and phone number (in case you are disconnected or the dispatcher needs additional information)

- If an ambulance is not needed:
  - Render first aid, only as trained.
  - Assist with transportation of employee to their personal physician, if appropriate.

- Make injured as comfortable as possible - do NOT move injured person unless directed by the 911 dispatcher (or if injured person is in immediate danger).

- Employees, an event witness or the employee’s supervisor shall complete an Employer’s First Report of Injury or Illness form to report any work injuries. Only facts, not opinions, should be stated on the form.

- Any time a safety issue arises, employees shall contact the appropriate supervisor immediately.

Additional Information

- The TTI Safety Office can assist with arrangements for personnel safety training in various areas and assist with written safety protocols.

- The TTI Safety Office shall review this program, at a minimum, on an annual basis.

- The TTI Safety Office is responsible for updating and maintaining this program with comments from the TTI Safety and Environmental Council.